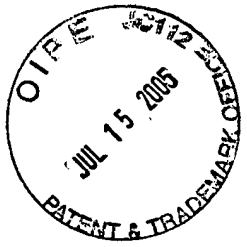

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INVENTOR: RICHARD R. KRAHN
MICHAEL S. SWEENEY
ARNOLD Z. HUFFMAN
CLIFFORD L. DONOUGHE
SHAWN C. CORNELIUS

TITLE: MANAGEMENT SYSTEM FOR REMOTELY MANAGING A DATA PROCESSING SYSTEM VIA A COMMUNICATIONS NETWORK

ATTORNEY: DARIN BARTHOLOMEW
BRINKS HOFER GILSON & LIONE
P.O. BOX 10395
CHICAGO, ILLINOIS 60610
(312) 321-4200

MANAGEMENT SYSTEM FOR REMOTELY MANAGING A DATA PROCESSING SYSTEM VIA A COMMUNICATIONS NETWORK

FIELD OF THE INVENTION

This invention relates to a management system for remotely managing a data processing system via a communications network, such as the Internet.

BACKGROUND

Business entities may exchange information over a communications network such as the Internet. For example, one business entity may engage in transactions with a group of trading partners. The business entities may exchange information about transactions in goods, transactions involving a service, financial transactions or other information to enhance business operations. Electronic communications may promote transactional efficiency, such as reduction of clerical errors from reduced human intervention or increasing the speed of executing transactions.

In the context of a business-to-business communications environment, each trading partner that is a participant in the transaction or communication may maintain a data processing system (e.g., a server) to support the communication. However, the trading partners may make conflicting technical decisions on the maintenance of hardware and software for various data processing systems involved in the business-to-business communications environment. Trading partners may not share adequate technical information with each other or may simply fail to coordinate the installation of software upgrades, even where adequate technical information about other trading partners is

available. For example, different trading partners may decide to upgrade their hardware or software platforms at different times which may result in the incompatibility of one or more software features or the inability to conduct a transaction. To avoid disruption of transactions or problems in the interoperability of technology and software functionality, the trading participants may agree to have upgrades and revisions handled by a single provider. Thus, a need exists for facilitating the single provider's management of the technical parameters of data processing systems of trading participants that may interact. Further, the need exists for efficiently providing software features and software upgrades for the trading participants in a business-to-business environment.

SUMMARY

In accordance with the invention, a management system communicates with at least one remote data processing system, associated with a trading participant, on a technical parameter of at least one remote data processing system. A technical parameter may refer to software specifications, hardware specifications, operational status of a data processing system, operational status of a software component of the data processing system, operational status of a hardware component of the data processing system, or any combination of the foregoing items. The management system receives a report message on the technical parameter via a communications network. The management system interprets or processes the report message for a presentation on a user interface of the management system. The management system presents the report message or another presentation on the user interface for review by a user.

In accordance with another aspect of the invention, the management system supports the upgrading of a software module resident in one or more remote data processing systems. In accordance with another aspect of the invention, the management system facilitates the upgrade of a software version of at least one software module at a remote data processing system to provide consistent technical interoperability between a base data processing system and one or more remote data processing systems. Accordingly, the management system is well suited for maintaining reliable communications and facilitating efficient transactions among the trading partners in a business-to-business, electronic commerce environment. Via the management system, a single service provider is able to upgrade the technical parameters of the business-to-business system in a uniform way that keeps the functionality of the remote data processing systems up-to-date without causing disruptions in communications from platform conflicts or other communication problems.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a block diagram of a business-to-business system including a management system in accordance with the invention.

FIG. 2 is a block diagram of the business-to-business communications system in greater detail than FIG. 1.

FIG. 3 is a flow chart of a method for monitoring a remote data processing system or systems from a management system in accordance with the invention.

FIG. 4 is a block diagram of a business-to-business system that supports monitoring of transactional data and confirmation data from a user interface in accordance with the invention.

FIG. 5 is a chart of transactional data and associated performance data that may be accessible via a management system of the invention.

FIG. 6 is a block diagram that illustrates an alternate embodiment of a remote data processing system in accordance with the invention.

FIG. 7 is a block diagram that illustrates an alternate embodiment of a business-to-business system with multiple remote management systems at different sites in accordance with the invention.

FIG. 8A and FIG. 8B are a flow chart of a method for updating a software module in accordance with the invention.

FIG. 9A and FIG. 9B are a flow chart of a method for adding a new feature to a remote data processing system via the management system in accordance with the invention.

FIG. 10 is a block diagram of an alternate embodiment of a business-to-business system in accordance with the invention.

DETAILED DESCRIPTION

In accordance with the invention, a business-to-business system 10 of FIG. 1 includes a primary business system 70 coupled to a base data processing system 12. The base data processing system 12 communicates with one or more remote data processing systems 18 via a communications network 16 (e.g., a virtual private network on the Internet). Each remote

data processing system 18 is coupled to a corresponding secondary business system 72. A management system 14 is coupled to the communications network 16, the base data processing system 12, or both. The management system 14 facilitates remotely monitoring technical parameters and remotely altering technical parameters of one or more remote data processing systems 18. A technical parameter generally refers to a software specification or characteristic of a data processing system, a hardware specification or characteristic of a data processing system, operational status data on a data processing system, operational status data on a software component of the data processing system, operational status data on a hardware component of the data processing system, or any combination of the foregoing items. The data processing system generically refers to the base data processing system 12, the remote data processing system 18, or both.

The primary business system 70 may exchange transactional data with one or more secondary business systems 72 via the communications network 16 to conduct a business-to-business transaction. To this end, the base data processing system 12 and at least one remote data processing system 18 act as intermediaries to facilitate communications via the communications network 16. For example, the base data processing system 12 may convert transactional data from the primary data processing system into an extensible mark-up language document (XML), a hyper-text mark-up language (HTML) document, or any other suitable data structure for transmission of transactional data over the communications network 16. Similarly, the remote data processing system 18 may convert the received transactional data from the base data processing system 12 from an XML document, an HMTL document, or another suitable data structure into a data protocol or format compatible

with the secondary data processing system 72. The transactional data (e.g., XML document) may be transmitted as one or more data packets over the communications network 16, consistent with the hypertext transfer protocol (HTTP), hypertext transfer protocol, secure (HTTPS), or any other suitable data protocol. HTTP and HTTPS define how data messages are formatted and transmitted, for example.

The primary business system 70 may manage transactional data or other data relevant to the business operations of a primary business entity. For example, the primary business system 70 may represent an enterprise resource planning system. An enterprise resource planning system refers to a computer system that may integrate one or more of the following business functions of an entity: manufacturing, accounting, management, purchasing, inventory control, and engineering. The base data processing system 12 may represent the business-to-business server of a primary business entity.

The secondary business system 72 may manage transactional data or other data relevant to the business operations of a secondary business entity. The secondary business system 72 may represent an enterprise resource planning system or another computer-related tool for managing a business entity. The primary business entity or an affiliate may be allocated the responsibility of maintaining and upgrading the software of the remote data processing systems 18. The remote data processing systems 18 may be controlled by a secondary business entity or a number of different secondary business entities, distinct from the primary business entity.

The base data processing system 12 may engage in a transaction with one or more remote data processing systems 18 over the communications network 16. Although any

number of remote data processing systems 18 may be used to practice the invention, in FIG. 1 the remote data processing system 18 may be designated a first remote data processing system 74, a second remote data processing system 76, and a third remote data processing system 78. Further, the first, second and third remote data processing systems (74, 76, and 78) may be affiliated with a first business entity, a second business entity, and a third business entity, respectively. The first business entity, the second business entity, and the third business entity represent secondary business entities, whereas a business entity of the base data processing system 12 represents the primary business entity.

The management system 14 may monitor a transaction or communication between the base data processing system 12 and any remote data processing system 18; particularly with respect to the functionality of application software of a base data processing system 12 and the remote data processing systems 18. Further, the management system 14 may monitor system level or network level communications between the base data processing system 12 and one or more remote data processing systems 18 to ensure reliable communications and a fault-tolerant environment.

The monitor 36 supports remote monitoring of the following attributes of remote data processing systems 18: (1) system monitoring of one or more interactions between the base data processing system 12 and the remote data processing system 18 via the communications network 16; (2) application monitoring of application software of the base data processing system 12, the remote data processing system 18, or both. System monitoring refers to monitoring of one or more system components that support application software (e.g., business-to-business application software). A system component refers to any software or

hardware that supports application software. A hardware component may include electrical connections between hardware components, a hard drive of a server, a server, a database manager 44, a database, and brokering architecture, among other items. A base data processing system 12 or a remote data processing system 18 may comprise a server (e.g., a business-to-business server). Brokering architecture may refer to any intermediate data processing system that interfaces one business system (e.g., primary business system 70) to a communications network 16 to support communications of data messages to another business system (e.g., a secondary business system 72) of a trading partner. The remote data processing system 18 or the base data processing system 12 represents an intermediate data processing system.

Applications monitoring refers to the monitoring of a software application (e.g., a software module), and may extend to the transactions that the software application supports. An active remote software module 60 (FIG. 2) or an active base software module 22 (FIG. 2) may represent applications software or a business-to-business software application.

The management system 14 supports remote monitoring, remote configuration, or both of software components of the remote data processing system 18. In one embodiment, the management system 14 allows a user or service provider to add, delete, or modify the software features of each remote data processing system 18 without requiring a person or technician to be at the location of the remote data processing system 18 where the software changes are proposed or being made. The management system 14 is particularly well suited for configuring a group of remote data processing systems 18 to promote technical compatibility. For example, the management system 14 may reduce travel expenses that

might otherwise be necessary to upgrade remote data processing systems 18 of different trading partners, which may be widely geographically dispersed. A trading group refers to a set of trading partners (i.e., business entities) that exchange information with each other via a communications network to conduct a transaction or otherwise support business-to-business commerce.

FIG. 2 shows an illustrative example of components that may be used to practice the configuration of FIG. 1. Like reference numbers in FIG. 1 and FIG. 2 indicate like elements.

The base data processing system 12 may refer to a business-to-business server or another computer intermediary that provides a communications interface between a primary business system 70 and a communications network 16. The base data processing system 12 may include a processor 20 in communication with a base status reporter 24 and a base communications interface 26. The processor 20 may execute an active base software module 22, which may be stored in a storage device (e.g., memory). For example, the active base software module 22 may support an electronic transaction with a trading partner with a complementary active remote software module 60 via a communications network 16. The base status reporter 24 may provide a local report message on technical parameters, operational status, or both pertaining to the base data processing system 12 or any of its constituent components. The base communications interface 26 supports communications between one or more of the following: the management system 14 and the remote data processing system 18. The lines interconnecting the components of the base data processing system 12 may represent logical data paths, physical data paths, or both.

The management system 14 includes a managing communications interface 28 that is a coupled to a data processor 30. In turn, the data processor 30 is coupled to a user interface 34 and a storage device 32. The lines interconnecting the components of the management system 14 may indicate logical data paths between the components, physical data paths between the components, or both.

The managing communications interface 28 may include a first port 81 for monitoring a base data processing system 12 and a second port 83 for monitoring the communications network 16. The traffic at the second port 83 may not be filtered by any firewall associated with the base data processing system 12 to allow greater flexibility in surveillance of the traffic on the communications network 16.

The data processor 30 includes a monitor 36, an interpreter 38, a controller 40, a database manager 44, and a presentation module 42. The monitor 36 may receive data from the managing communications interface 28. The received data may originate from the base data processing system 12 or one or more remote data processing systems 18 via the communications network 16.

The interpreter 38 extracts or accepts technical parameter data or processed technical parameter data from the monitor 36. The interpreter 38 refers to an evaluator that interprets or evaluates the monitored technical parameter data to determine whether and how the monitored technical parameter data is relevant to operational status, maintenance or upgrading. The interpreter 30 may establish alarm criteria that represents the need for undergoing an update procedure or a new feature upgrade of the remote software module 60,

for example. The interpreter 38 may forward interpreted information to the presentation module 42.

The presentation module 42 prepares information for presentation by a user interface 34, such as a graphical user interface 34. For example the presentation module 42 may arrange the information by identity of different trading partners or different transactions.

The database manager 44 may communicate with the interpreter 38, the managing communications interface 28, a storage device 32, and other components of the data processor 30, where necessary or appropriate. The storage device 32 stores one or more of the following databases: a reference parameters database 46, a received parameters database 48, and an upgrade module database 50. The database manager 44 manages query, storage and retrieval operations from one or more data bases stored within the storage device 32.

The reference parameters database 46 stores the reference technical parameters on the remote data processing systems 18. For example, the reference technical parameters may include the following information on each remote data processing system 18: a remote identifier (e.g., server identifier), hardware specifications, software specifications, a software module identifier, a software version identifier of each software module, operational status data (e.g., acceptable ranges of performance metrics), and any other data relevant to the proper technical operation of the remote data processing system 18 for communications and conducting transactions over the communications network 16. Each remote data processing system 18 may be identified by a remote identifier to support different configurations at the different remote data processing systems of a trading group or multiple trading groups. The remote data processing system of the same trading group may be assigned a group identifier.

The received technical parameter database contains received technical parameters on the actual technical parameters (e.g., specifications or actual operational parameters) of the remote data processing system 18. The reference technical parameters may define a reference or desired configuration of a corresponding remote identifier or trading group identifier. In contrast, the reference parameters contain reference data on the remote data processing system 18.

In an alternative embodiment the received technical parameter database may be omitted from the storage device 32.

The storage device 32 preferably includes an upgrade module database 50 for storing software modules for new features, revisions or updates of the remote data processing systems 18. For example, the upgrade module database 50 may include an upgrade remote software module, a desired version (e.g., latest version) of an upgrade remote module, an upgrade base software module, a new version of an upgrade base software module, or any combination of the foregoing items. The data processor 30 may select and extract a requisite or desired upgrade module from the upgrade module database 50 based on a comparison of the received technical parameters to reference technical parameters in the reference parameters database 46. The database manager 44 forwards the requisite upgrade software module or desired version (e.g., new version) of the software module to the managing communications interface 28. In turn, the managing communications interface 28 sends the upgrade software module to one or more remote data processing systems 18 that require an upgrade or desired version via the communications network 16. The communications network 16 may refer to the Internet, an intranet, a virtual private network, a dedicated

communications line, a public switched telephone network (PSTN), a data packet network, a virtual communications path, a physical communications path, or another telecommunications link.

Each remote data processing system 18 may include a remote communications interface 52 that supports communications with the managing communications interface 28 via the communications network 16. Each remote communications interface 52 may maintain a remote identifier (e.g., a remote station identifier) for facilitating selective communications over the communications network 16 between one or more of the following network elements: (1) the base data processing system 12 and a corresponding remote processing system and (2) a management system 14 and a corresponding remote data processing system 12 (e.g., first remote data processing system 74)

The remote communications interface 52 of the remote data processing system 18 may communicate with a remote control module 54. The remote control module 54 may contain a revision module and an interface for communicating to a storage device 62. The remote control module 54 may supervise the holding of an upgrade module or desired (e.g., new) version of a software module sent from the management system 14 to the remote data processing system 18, until the upgrade can be made at a suitable time. The suitable time may be established by coordinating the upgrade with ongoing transactions such that a ongoing transaction between the remote data processing system 18 and the base data processing system 12 is not interrupted by the upgrade of the software module. Further, the suitable time may require the remote control module 54 to wait to upgrade a software module in the remote data processing system 18 until confirmation or verification is received that the

remote data processing system 18 has adequate hardware to support the upgrade software module. If the hardware of a particular one of the remote data processing systems 18 is inadequate to support the upgrade, the remote status reporter 56 may send a data message to the management system 14 indicating that a hardware upgrade is necessary. The hardware upgrade may require the dispatch of a technician to the remote site where the particular one of the remote data processing systems 18 resides.

The remote status reporter 56 may provide general status information on the technical parameters of the remote data processing system 18. The technical parameters may include the technical specifications, operational status, or both of the remote data processing system 18. Operational parameters include transactional data and application functionality of the remote data processing system 18. The remote status reporter 56 may monitor the hardware operations, software operations or both of the remote data processing system 18 to provide the management system 14 with technical parameter data for archiving in a remote performance database 64 or transmission to the management system 14. The remote performance database 64 may be stored in the storage device 62 for subsequent transmission to the management system 14 for display via the user interface 34 or archiving the received parameters database 48.

The remote data processing system 18 includes one or more active or installed remote software modules 60. The remote status reporter 56 can provide an inventory of the active or installed remote software modules 60 as received technical parameter data to determine whether an upgrade revision or new version of the remote software module 60 is required in the form of an upgrade module or a new version of a remote software module 60. An

inventory may refer to a list of installed remote software modules 60 by module identifier, for example.

The user interface 34 may be used to display the status report that the remote status reporter 56 transmits. The presentation module 42 may format the received status report to inform a user of functional problems or operational problems in the remote data processing system 18 that may require attention. The status report may include a remote identifier to identify the particular problematic remote data processing system . Accordingly, if the management system 14 is monitored by a human or live operator, the operator may well represent a single point of network service and operations management for all of the trading partners of the business-to-business environment.

The foregoing upgrade functionality of the base data processing system 12 and the management system 14 supports efficient software upgrades and troubleshooting of remote data processing systems 18 without the need to dispatch a technician to various geographic locations (e.g., sundry cites) of different trading partners. Thus, the configuration is well suited for trading partners that are widely geographically dispersed such that traveling expenses of technicians and time involved in the upgrade may be greatly reduced over manual upgrades that would otherwise involve a technician loading software into one or more remote data processing systems 18 via an optical media such as a compact-disk, read-only-memory (CD ROM disk), a magnetic tape, a floppy disk or a removable disk drive.

FIG. 3 is a block diagram of a method for monitoring the operation of one or more remote data processing systems 18 via a communications network 16. The management

system 14 may support the monitoring operation of FIG. 3. The method of FIG. 3 starts in step S10.

In step S10, the management system 14 or the base data processing system 12 polls or communicates with one or more remote data processing systems 18 via the communications network 16. For example, the management system 14 may transmit a data message query to remote business-to-business servers as the remote data processing systems 18. Each remote data processing system 18 may be associated with a different trading partner. The polling may seek information on at least one technical parameter of software, hardware or both of each respective remote data processing system 18. The technical parameter may comprise a technical specification or characteristic of a particular remote data processing system 18 or an operational status of a particular remote processing data system 18. For example, the operational status may represent transactional data that is provided by a secondary business system 72.

In step S12, the management system 14 or the managing communications interface 28 receives a report message on the at least one technical parameter via a communications network 16. For example the remote status reporter 56 may obtain technical parameters (e.g., operational status data) of the remote software module 60 of the remote data processing system 18. After gathering the technical parameter data the remote status reporter 56 may forward the technical parameter data to the remote communications interface 52 where the remote communications interface 52 conveys the technical parameter data to the managing communications interface 28 via the communications network 16.

At the management system 14 in step S14, the data processor 30 or the interpreter 38 interprets the report message or the underlying technical parameter data for a presentation on a user interface 34. For example, the interpreter 38 may organize or filter the received report messages from different remote data processing systems 18. The information may be displayed at the user interface 34 (e.g., graphical user interface 34) by the identity of different trading partners having associated corresponding remote data processing systems 18.

In one confirmation, the interpreter 38 may organize a filter for display based upon a defined alarm or the occurrence of a triggering event. The defined alarm may be established where a pre-designated condition is established as a trigger for displaying the alarm or alerting a user at the user interface 34. For example, a pre-designated condition may include the occurrence of a particular transaction with certain characteristics or a operational status of hardware, a software module, or both.

In step S16, the report message is presented on a user interface 34 for review. The information or report message presented to the user may afford the user the opportunity to authorize a manual upgrade or revision of software (e.g., a remote software module 60) in a remote data processing system 18, the base data processing system, 12, or both. The user may resolve a compatibility problem or engage in other troubleshooting action to enhance reliability in the communications network 16 based on an interpretation of the report message or other monitored information provided by the remote status reporter 56.

FIG. 4 shows an illustrative exchange of data in a business-to-business system in accordance with the invention. Like reference numbers in FIG. 4 and FIG. 1 indicate like elements.

A user interface 102 is coupled to the primary business system 70. In turn, the primary business system 70 is coupled to a base data processing system 12. The base data processing system 12 communicates with a remote data processing system 18 via a communications network 16. The remote data processing system 18 is coupled to a secondary business system 72. The management system 14 (e.g., a monitoring system) is coupled to the base data processing system 12 for monitoring the status of one or more of the following: confirmation data 103, transactional data 101, a software module, and a component of the remote data processing system 18. The management system 14 can monitor and configure the remote data processing system 18. However, the management system 14 is not necessarily configured to monitor or configure the secondary business system 72 because of security measures (e.g., a firewall) and other technical considerations.

The user interface 102 supports monitoring of the system on a transactional or business level. For example, the user interface 102 may allow a user to enter or approve transactional data 101 associated with the primary business system 70. The primary business system 70 interacts with the secondary business system 72 to convey or exchange the transactional data 101 over the communications network 16. For example, the primary business system 70 may send transactional data 101 to the secondary business system 72 via the communications network 16. The secondary business system 72 may generate confirmation data 103 or an acknowledgement upon receipt of the transactional data 101,

successful execution of the transactional data 101, or both. If a communications fault or another problem is present in the business-to-business system of FIG. 4, the primary business system 70 may not receive the confirmation data 103.

A user may monitor and review transactional data 101 and associated confirmation data 103 on the user interface 102 to detect problems at a business level or transactional level. In general, only the party entering transactional data 101 can change the transactional data 101 to resolve a transactional problem so as to avoid deletion, corruption, or unwanted changes to the transaction underlying the transaction data. If a problem is identified, a management system 14 may provide a technical analysis of the problem in greater detail than that available to the user interface 102.

FIG. 5 provides a chart of a representation that a management system 14 may provide for reviewing the transactions of a group of trading partners in a trading group. The first column represents trading partner identifiers 104. In the example shown, the trading partner identifiers 104 refer to a first trading partner 109, a second trading partner 110, and a third trading partner 111 through an Nth trading partner 112.

The second column refers to transaction identifiers 105. Each transaction identifier 105 refers to a symbol, a code, or a number that represents a unique identifier to distinguish one transaction from another. The transaction identifiers 105 may include revision codes, if the same transaction is attempted multiple times.

The third column contains transmittal times 106. The transmittal time 106 refers to a time and date in which transactional data 101 was transmitted from the base data processing system 12 to the remote data processing system 18 over the communications network 16.

Alternatively, the transmittal time 106 refers to the time and date in which the primary business system 70 sends the transactional data 101 to the base data processing system 12 for transmission to the remote data processing system 18 via the communications network 16.

The fourth column represents acknowledgement receipt time 107. The acknowledgement receipt time 107 refers the time when the base data processing system 12 or the primary business system 70 receives acknowledgement data transmitted by the secondary business system 72, the remote data processing system 18, or both. In one embodiment, the secondary business system 72 generates and sends acknowledgement data in response to the successful receipt (e.g., received and detectable without a significant error rate that detracts from data reliability) of transactional data 101. The acknowledgement data is sent to a business entity identifier that is associated with the transactional data 101. In another embodiment, the remote data processing system 18 generates acknowledgement data or sends feedback data to the base processing system 12. The management system 14 may review the acknowledgement data or the feedback data to provide a fault analysis, a troubleshooting analysis, or the like.

The last column of FIG. 5represents status data 108. The status data 108 may be derived from or expressed as the feedback data, the acknowledgement data, or both. Although a myriad of possible status representations exists, as shown in FIG. 5 the status data 108 includes one or more of the following states: transaction complete, transactional data 101 not received, transactional data 101 corrupt, remote data processing system 18 is down, communications network 16 is down, and secondary data processing system is down,

an installed remote software module 160 or a component of the remote data processing system 18 is not operational.

FIG. 6 is a block diagram of an alternate embodiment of a remote data processing system 118 that supports various fault analysis procedures in accordance with the invention. The remote data processing system 118 may convey the fault analysis data (e.g., trouble-shooting report) to or otherwise make the fault analysis available for review by the remote management system 14. Like reference numbers in FIG. 1 and FIG. 6 indicate like elements.

In FIG. 6, the primary business system 70 is coupled to base data processing system 12. The base data processing system 12 communicates with a remote data processing system 118 via the communications network 16. In turn, the remote data processing system 18 is coupled to the secondary business system 72. The primary business system 70 and the secondary business system 72 may interact by using the base data processing system 12 and the remote data processing system 118 as intermediaries. The remote management system 14 monitors the base data processing system 12, the remote data processing system 118, or both.

The remote data processing system 118 of FIG. 6 differs from the remote data processing system 18 of FIG. 1 in the following respects. First, the remote data processing system 118 of FIG. 6 includes a multi-stage, remote software module 160. Second, the remote status reporter 156 includes a fault detector 165 and a feedback generator 164.

Although the multi-stage, remote software module 160 may include any number of stages, in FIG. 6, three stages (161, 162, 163) are shown. The stages (161, 162, 163) are designated as a first stage software component 161, a second stage software component 162, and a third stage software component 163. The lines interconnecting the stages (161, 162,

163) indicate logical data paths, physical data paths, or both. The stages (161, 162, 163) are arranged in tandem or series such that transactional data 101 or another data message received from the base data processing system 12 via the communications network 16 is processed successively by each of the stages (161, 162, 163) or in some other defined order. Once one stage has initiated or completed processing the data message (e.g., transactional data) or a derivative thereof, the data message or its derivative is typically passed on or handed of to the next stage, unless the remote multi-stage software module 160 is not functioning appropriately or unless the processing of the next stage is not required.

The fault detector 165 detects whether the software module 160 is functioning appropriately by tapping into the logical data paths or physical data paths between the stages (161, 162, 163). If the data message (e.g., transactional data 101), its derivative, or its precursor is present at an earlier stage and absent at a later stage after the earlier stage has initiated or completed its processing, the fault detector 165 may determine that the stage immediately following the last detected data message is at fault. The fault detector 165 may assign a stage identifier to distinguish one stage from another and to identify a faulty stage. Further, the fault detector 165 may associate a fault description (e.g., a fault code) with the stage identifier for transmission to the remote management system 14 or the base data processing system 12 via the communications network 16.

The fault detector 165 may archive its analysis or detected faults, stage identifiers, and fault descriptions in a database 200 associated with the remote data processing system 118. The remote data processing system 118 may query the database and retrieve information from the database 200 to identify and solve technical problems. For example,

the database 200 may contain a list of network elements or components of the remote data processing systems 118, and corresponding status data 108 on whether the components are active or operational. In one embodiment, the remote management system 14 determines if each remote data processing system 118 is active, operational, or responsive on a site-by-site basis by accessing a group of databases 200 for association with the trading partners.

The feedback generator 164 may be coupled to the fault detector 165. When the business-to-business system is fully functional, the feedback generator 164 may recirculate a status indicator (e.g., a dummy or known sequence bit stream) that is received from the base data processing system 12 by the data receiver 172. The feedback generator 164 may verify the presence of the status indicator at a last stage (e.g., third stage software component 163) of the remote software module 160. If the status indicator is present at the last stage, the feedback generator 164 may forward the status indicator or regenerate the status indicator for transmission back to base the data processing system 12 or the remote management system 14. The status indicator may be directed to the transmitter 118 for transmission to the base data processing system 12 as an indicator that all of the stages of the remote software module 160 are functioning and the communications network 16 is operational.

The circulation of the status indicator flows from the base data processing system 12 to the remote data processing system 118 and then back to the base data processing system 12 for detection by the remote management system 14. The circulation may be referred to as a heart-beat indicator because the heart-beat indicator may be configured to be present when the business-to-business system (e.g., trading system) is properly operating. The heart-beat indicator may represent a string of known symbols or a status indicator that is generated

repetitively and coincident with a interval. An outbound heart-beat indicator from the base data processing system 12 is preferably followed by an inbound heart-beat indicator, thereafter, in a properly functioning system.

FIG. 6 primarily concerns the monitoring capabilities of the remote management system 14, as opposed to the control capabilities of the management system 14. Accordingly, in an alternate embodiment, the remote management system 14 of FIG. 6 may be replaced by a remote monitoring system.

Once a technical problem is detected or discovered, the remote management system 14 may access the database 200 at the remote data processing system 118 to retrieve any error messages that the fault detector 165 or the remote status reporter 156 have logged and recorded in the database 200. The management system 14 may present error messages (e.g., error codes) to a user via a graphical user interface, start the flow of error messages for receipt at the management system 14, and stop the receipt of error messages for reviewing at the management system 14. The management system 14 may view the transactions or operation of the remote software module 160 when the software module is operational. The management system 14 may instruct the remote data processing system 118 to reprocess a data message, transactional data 101, or other business data if an error occurs.

The remote management system 14 may send a reset message or a restart message to reset or restart one or more of the following components of the remote data processing system 18: the first stage software component 161, the second stage software component 162, the third stage software component 163, and the remote software module 160. The

remote management system 14 may also shut down a particular stage or stages of the remote software module 160 on a stage-by-stage basis, or otherwise.

If the remote software module 160 or a stage remains non-responsive after the resetting or restarting, the remote management system 14 has the capability to remotely change technical parameters associate with the remote software modules 160, to remotely change technical parameters associated with any stage software component, and to remotely upgrade a portion of a software module or an entire software module or component via the communications network 16. The upgrading of a technical parameter may be preferred to upgrading an entire program or software module because of the lesser bandwidth or communication resources of the communications network 16 required to transmit technical parameter data than an entire program, for example. Moreover, technical parameters may be changed more quickly because of the elimination of the need to transmit a software module or software component, followed by installation of the software module or component at the remote data processing system 118.

The forgoing control and management features of the remote management system 14 may facilitate ready replacement of corrupt data, incompatible program components, and remedying of software bugs. Software patches are readily and quickly distributed to all members of the trading group to solve certain problems.

FIG. 7 shows a hub and spoke arrangement of a business-to-business trading system in accordance with the invention. The business-to-business trading system applies to trading partners of a single trading group, for example. Although a first trading partner's infrastructure 166, a second trading partner's infrastructure 167, and a third trading partner's

infrastructure 168 are shown in FIG. 7, in practice virtually any number of trading partners of a trading group may participate with their associated infrastructure. Each trading partner's infrastructure may be located at a different geographic site. A trading partner's infrastructure (166, 167 and 168) may comprise a data processing system 171 (e.g., a business-to-business server or a base data processing system 12) coupled to a business system 170 (e.g., a primary business system) and a remote management system 14.

The remote management system 14 may be applied to the infrastructure of at least two different trading partners (e.g., at all trading partner sites). FIG. 7 differs from the configuration of FIG.1 in that the remote management system 14 of FIG. 1 was controlled by and only present at a primary business entity or primary service provider. Here, the presence of multiple remote management systems 14 in the same trading group facilitates shared management of the business-to-business system among the trading partners to distribute maintenance and operational expenses within the trading group. For example, the trading partners may agree to staff only one of the management systems 14 at any given time, during alternating time periods, or in accordance with a schedule to distribute labor costs among employees or workers affiliated with different trading partners. Further, even if the trading partners do not share the responsibilities of monitoring the system or updating software modules, the trading partners may assist one another to resolve technical disputes from different perspectives available from remote management systems 14 distributed at different sites.

FIGs. 8A and 8B represent a flow chart of an update procedure for updating a remote software module 60 resident in a remote data processing system 18 remotely via a

communications network 16 and the management system 14. The method of FIG. 8A and FIG. 8B begins in step S20.

In step S20, a management system 14 or a base data processing system 12 communicates with one or more remote data processing systems 18 (e.g., remote business-to-business servers) associated with trading partners on technical parameters of software, hardware, or both of each remote data processing system 18. For example, the management system 14 polls remote data processing systems 18 associated with trading partners on technical parameters (e.g., operational status) of software, hardware or both of each remote data processing system 18. If the base data processing system 12 handles the polling of different remote data processing systems 18, the base data processing system 12 may route, direct, or forward any response of the remote data processing systems 18 to the management system 14.

In an alternate embodiment, one or more remote data processing systems 18 may report technical parameters of software, hardware, or both to the management system 14 on a contention basis, rather than a polling basis. In a contention scheme, each remote data processing system 18 may transmit a report message upon the occurrence of one or more of the following: detection of new information on the operational status, the detection of new information on technical parameters, and the expiration of a timer. In one version of a contention scheme, if two remote data processing systems 18 attempt to transmit the report message to the management system 14 at the same time, the managing communications interface 28 may assign a temporary priority level to each of the remote data processing systems via the remote communications interface 52 to determine the sequence of

transmission. In another version of a contention scheme, if two remote data processing systems 18 attempt to simultaneously transmit report messages to the managing communications interface 28, the managing communications interface 28 may invoke the remote communications interface's assigning of a random transmit time for the report messages to avoid the conflict.

In step S22, the management system 14 receives a report message or an indication on at least one of the technical parameters via the communications network 16. In one embodiment, the report message may constitute an acknowledgement. The indication may constitute the lack of an acknowledgement that indicates disablement of particular remote data processing system 18 where the management system 14 expects a certain acknowledgment in response to a polling message transmitted in step S10 to the particular remote data processing system 18.

The technical parameter or parameters of the remote data processing system 18 include one or more of the following items: a type of software module installed in a corresponding remote data processing system 18, a version of a software module or software installed in the corresponding remote data processing system 18, the active or available features that have been activated or authorized for use by the corresponding remote data processing system 18, hardware specifications of the remote data processing system 18, software specifications on an active remote software module 60, application specifications, operating system specifications, and operational status data. The technical parameters may be expressed as technical parameter data.

The operational status includes the execution or ongoing execution of processing by a particular remote data processing system 18 associated with a corresponding remote identifier. The operational status data may indicate whether the performance of the remote data processing system 18 complies with a target performance metric (e.g., a target executable time per transaction). For example, the operational status data may indicate whether a particular remote data processing system 18 is operational or disabled with respect to executing one or more transactions.

In step S24 at the management system 14 or the a database manager 44 retrieves reference technical parameter data on hardware, software or both from a reference parameters database 46. The reference parameters database 46 may store reference technical parameter data on reference technical parameter (e.g., reference operational data or a reference performance metric target).. The reference technical parameter data may define a requisite configuration for one or more remote data processing systems 18 to foster compatibility with the base data processing system 12.

In one embodiment, the reference technical parameter data include groupings of a reference base software module 22 and one or more reference remote software module 60 that are compatible with the reference base software module 22. The grouping may coincide with trading groups. Any software modules may be defined by type of software module, version of the software module, or a module identifier that indicates type of the software module and the version of the software module.

In another embodiment, the reference technical parameter data may include a latest feature set or desired feature set for conducting business-to-business transactions with the

trading partners via a communications network 16. The latest feature set may establish a desired configuration for each remote data processing system 18 and the base data processing system 12 of a trading group. The trading partners of the trading group may contractually agree to the latest feature set of the desired feature set or reach a consensus for the desired feature set in another manner.

The reference technical parameter data in the reference parameters database 46 may be entered via a user interface 34. For example, a service provider or technician may enter desired or aspirational reference technical parameter data into the reference parameters database 46 for upgrading and maintaining the functionality of the business-to-business environment among the trading partners. The level of performance and the finances required to achieve a desired level of performance may require some degree of balance and judgment by a service provider. Accordingly, the reference parameter data in the reference parameters database 46 may represent the consensus of the trading partners on what level of performance, which may be less than aspirational technical parameters, is acceptable for conducting business over the communications network 16. The consensus may also be delegated to the service provider who controls the management system 14 and is bound to adhere to a certain budgetary constraint for example. From time to time, a service provider may update the reference database 46 to achieve enhanced functionality or to add new features to the business-to-business environment.

In step S26 following step S24, a data processor 30 of the management system 14 determines if the received technical parameter data in the report message from the remote status reporter 56 of the remote data processing system 18 complies with or matches the

reference technical parameter data retrieved from the reference parameters database 46. The data in the reference parameters database 46 may be organized be remote identifiers of different remote data processing system 18. The remote identifier may indicate the identity of a particular corresponding remote data processing system 18 or the identity of a business entity affiliated with the remote data processing system 18.

The comparison in step S26 preferably compares the reference technical parameter data with the received technical parameter data on a remote-identifier basis, where each trading partner has a remote identifier associated with a corresponding remote data processing system 18. If the data processor 30 determines that the received technical parameter data of the particular data processing system (e.g., next business-to-business server) complies with or matches the reference technical parameter data then the method continues with step S28. However, if the data processor 30 determines that the received technical parameter data of the particular data processing system does not comply with or match the reference technical parameter data then the method continues with step S32.

In step S28, the processor determines if all of the remote data processing systems 18 (e.g., business-to-business servers) in a defined group (e.g., trading group) have been checked for compliance with the applicable reference technical parameter data. That is, the processor determines if the remote data processing systems 18 affiliated with each trading partner have been previously evaluated in accordance with step S26. If all of the remote data processing systems 18 in the defined group have not been checked for compliance with the reference technical parameter data, then the method continues with step S26, wherein the next remote data processing system is evaluated. A counter may be incremented each time

the received parameters of a different remote data processing system 18 are evaluated until the counter reaches the total number in the defined group. Once the counter reaches the total number of the defined group, all of the remote data processing systems 18 within the group have been considered. Accordingly, if all of the business-to-business servers in a defined group have been checked for compliance with the reference technical parameter data, then the method ends in step S30.

In step S32, which may follow step S26, the data processor 30 determines if the same type of software modules are specified in the reference technical parameter data as the received technical parameter data with respect to a particular remote data processing system 18. If the same type of software modules are specified in both the reference technical parameter data and the received technical parameter data, then the method continues with step S36. If different types of software modules are specified in the reference technical parameter data and the received technical parameter data, then the method continues with step S34.

In step S34, the management system 14 or a communications interface (e.g., base communications interface 26) sends or allocates a new software module to the particular remote data processing system 18 to remedy the detected discrepancy of the software type of step S32. For example, the management system 14 may retrieve a software upgrade module from an upgrade module database 50 and authorize the transmission of the retrieved software upgrade module to the remote data processing system 18 via the communications network 16.

Here, the particular remote data processing system 18 refers to an upgrade candidate that is identified based on the detected deficiency. If the particular remote data processing system 18 has the requisite hardware to support the upgrade software module, a remote status reporter 56 of the data processing system may send a hardware status report to the management system 14 with the remote identifier of the remote data processing system 18 and technical parameter data to indicate that the hardware is capable of supporting a new upgrade module. However, if the particular remote data processing system 18 lacks the requisite hardware to adequately support the upgrade software module, a remote status reporter 56 may send technical parameter data (e.g., a hardware status report) to the management system 14 so indicating along with the remote identifier.

The management system 14 may handle the transmission of the upgrade to the remote data processing system 18 in accordance with various alternative techniques. Under a first technique, the upgrade software module is not sent to the remote data processing system 18 until the remote data processing system 18 is authorized to install the upgrade software module by a confirmation of readiness or preparedness from the remote status reporter 56 of the remote data processing system 18 to be upgraded. For example, upon receipt of a confirmation of adequate hardware to support the upgrade software module at the particular remote data processing system 18, the management system 14 may authorize transmission or transmit the upgrade module to the remote data processing system 18 via the communications network 16.

In accordance with a second technique for upgrading the software, the upgrade software module may be sent to the remote data processing system 18 even though the

remote data processing system 18 is not authorized to actually execute the upgrade. In such case the base data processing system 12 sends an upgrade software module from the upgrade module database 50 with a wait flag to indicate that the remote control module 54 should not install the upgrade module until it is authorized to do so from a follow-up communication from the management system 14. For example, a remote status report from the remote data processing system 18 to the management system 14 may trigger the installation of the upgrade module into the remote data processing system 18 to replace an existing active remote software module 60 upon approval from the management system 14. The wait flag is removed once authorization is received to execute the upgrade.

In step S36, the data processor 30 or management system 14 determines if the same version of the software module is present in the received parameters data and in the retrieved reference parameter data. The version of the software module may impact the features that are available in the same type of software module or the interoperability of software modules. For example a software module of an earlier version and a later version may or may not be compatible. Similarly, an earlier version of the software module may require less rigorous or less elaborate hardware components than a later version of the same type of software module. In general, each remote software module 60 may be associated with a version identifier and a general module identifier to facilitate comparison of the different software modules.

If the data processor 30 or management system 14 determines that the same version of the software module is present in the received technical parameter data as that specified in the referenced technical parameter data, then the method continues with step S40. However,

if the same version of the software modules is not specified in the referenced technical parameter data and the received technical parameter data, then the method continues with step S38.

In step S38, the managing communications interface 28 or the management system 14 sends or allocates a desired version (e.g., latest version) of the software (e.g., a new remote software module) to the particular remote data processing system 18 with a particular identifier consistent with the software version deficiency identified in step S36. Here, the particular remote data processing system 18 refers to the remote data processing system 18 with the software version deficiency noted in step S36.

The management system 14 may handle the transmission of the latest or desired version of the upgrade to the remote data processing system 18 in accordance with various alternative techniques. Under a first technique, the desired version of the upgrade software module is not sent to the remote data processing system 18 until the remote data processing system 18 is authorized to install the upgrade software module by a readiness confirmation from the remote status reporter 56 of the particular remote data processing system 18 to be upgraded. For example, upon receipt of a confirmation of adequate hardware to support the upgrade software module at the particular remote data processing system 18, the management system 14 may authorize transmission or transmit the desired version of the upgrade software module to the remote data processing system 18 via the communications network 16.

In accordance with a second technique for upgrading the version of the software, the desired version of the upgrade software module may be sent to the remote data processing

system 18 even though the remote data processing system 18 is not authorized to actually execute the final installation of the upgrade. In such case the base data processing system 12 sends the desired version of the upgrade software module from the upgrade module database 50 via the database manager 44 with a wait flag to indicate that the remote control module 54 should not install the desired version of the upgrade module until it is authorized to do so from a follow-up communication from the management system 14. For example, the remote status report from the data processing system may trigger the installation of the upgrade module into the remote data processing system 18 to replace an existing active remote software module 60 upon approval from the management system 14. The wait flag is removed once authorization is received to execute the installation of the desired version of the upgrade.

Step S40 may follow step S36 or step S38. In step S40, the data processor 30 or management system 14 determines if a hardware upgrade or additional hardware is required to support the planned installation of the upgrade software module, a new software module or the desired version of the software module. The remote control module 54 confirms whether the remote data processing system 18 has the requisite hardware to support the desired or latest version of the software module, either prior to sending the desired version of the software module to a remote data processing system 18 via the communications network 16 or prior to authorizing the remote data processing system 18 to install the sent upgrade software module into the remote data processing system 18. At the remote data processing system 18, the remote control module 54 may seek the receipt of an approval from the

management system 14 before implementing or installing any received upgrade module from the management system 14.

If the processor determines that additional hardware upgrade or additional hardware is required to support the planned installation, then the method continues with step S42. However, if the processor determines that a hardware upgrade is not required to support the planned installation of the upgrade software module or the particular desired version of the upgrade software module, then the method continues with step S44.

In step S42, the presentation module 42 or the management system 14 generates an alert message for presentation of a user interface 34. The alert message may inform a user that a hardware upgrade may be required for the particular remote data processing system 18. Accordingly, the management system 14 may wait prior to sending an upgrade software module or an authorization to install the upgrade software module in the remote data processing system 18 via the communications network 16.

The authorization or validation may occur where the remote data processing system 18 generates a status report from the status reporter 56 that indicates that a hardware revision has taken place. The hardware specifications may be sent to the management system 14 as technical parameter data and the base data processing system 12 or the management system 14 may generate an approval message that authorizes the installation of the remote software module upgrade resident in or transmitted to the remote data processing system 18.

In step S44, the remote data processing system 18 revises the software configuration of the remote data processing system 18 based on the receipt of one or more of the following items: an appropriate version of the software to overcome a software version deficiency

noted in step S36, an appropriate upgrade software module to overcome a software type deficiency noted in step S32, a latest version of an upgrade software module, and a new software module. The revision module at the remote data processing system 18 is responsible for revising or updating the software configuration of the remote data processing system 18. For example, the revision module may replace an outdated, active remote software module 60 with an upgrade software module received from the management system 14 upon approval of the management system 14 or otherwise.

In step S46 following step S44, the monitor 36 of the management system 14 may confirm replacement or revision by querying or checking the operational status of the revised or upgraded remote data processing system 18 via a direct request via the communications network 16 or incidental to a polling procedure for monitoring operational status of the remote data processing system 18. For example, the remote data processing system 18 may send an acknowledgment that the revision module has successfully revised the software module within the remote data processing system 18.

If the replacement or revision is monitored pursuant to a polling procedure, the management system 14 may experience a delay of one polling cycle before the confirmation is received. In contrast, the direct request via the communications network 16 may produce a rapid turnaround time.

Following step S46, the method may return to step S28. The base data processing system 12 may be affiliated with a primary trading partner at a primary site, whereas the remote data processing systems 18 may be affiliated with secondary trading partners that receive information technology service and upgrades of their remote data processing

systems 18 via the primary trading partner or an affiliated service provider. The return to step S28 ensures that the management system 14 has considered the remote data processing systems 18 of each of the secondary trading partners. The defined group of trading partners specified in step S28, and generally in FIG. 8A and FIG. 8B, may be, but need not be, restricted to less than all of the available trading partners of a trading group to meet the particular needs and circumstances of the primary and secondary trading partners.

The method of FIG. 9A and FIG. 9B shows a flow chart of managing a remote data processing system that supports adding or removing a feature from one or more remote data processing systems 18 in accordance with the invention. Like steps in FIG. 8A and FIG. 8B are indicated by like reference numerals in FIG. 9A and FIG. 9B. The method of FIG. 9A and FIG. 9B is similar to the method of FIG. 8A and FIG. 8B except the method of FIG. 9A and FIG. 9B includes step S18.

Step S18 precedes step S20. In step S18, a user at the management system 14 may enter data on revising the reference technical parameters and the reference parameters database 46 such that a reference configuration for a corresponding remote data processing system 18 reflects a new feature for installation at the remote data processing system 18 (e.g., remote business-to-business server). The reference parameter data within the reference parameters database 46 may be specified on a remote-identifier basis such that each secondary trading partner is compatible with the base data processing system 12 for a trading group. Further, each secondary trading partner within the trading group may be configured identically or differently so long as compatibility with the base data processing system 12 of the trading group is maintained. Accordingly, different remote data processing systems 18

may support different features depending upon the needs of the trading partners within the trading group.

The reference parameter data may be grouped according to one or more remote identifiers of corresponding remote data processing systems 18. The reference parameter data may include hardware specifications, software specifications, a presence of a particular type of software module, the absence of a particular type of software module, a desired version (e.g., a latest version) of a software module, the desired version of an operating system, the type of an operating system, or other parameters that may affect the operation and reliability and interoperability of the remote data processing system 18 with the base data processing system 12 via the communications network 16.

FIG. 10 shows an alternate embodiment of the data processing system. Like reference numerals in FIG. 1 and FIG. 10 indicate like elements. The system of FIG. 10 is similar to the system of FIG. 1 except the system of FIG. 10 includes firewalls as a security measure to protect the integrity of the data shared by the trading group from tampering by unauthorized users.

The base data processing system 12 may be associated with one or more firewalls. Similarly, the remote data processing system 18 may be associated with one or more firewalls. In one embodiment, an outer firewall 66 is placed in the communication path between the communications network 16 and a data processing system (e.g., base data processing system 12 or a remote data processing system 18), whereas an inner firewall 68 is disposed in a communications path between the remote data processing system 18 and a secondary business system 72. A firewall, inner firewall 68, or outer firewall 66 refers to

software, hardware, or both that filters or blocks the passage of data messages that meet a defined security criteria. The defined security criteria may represent a source identifier, a destination identifier, a content indicator, or some other attribute associated with the data message. The source identifier and destination identifier may be found in a header of a data packet under certain data protocols, for example.

The management system 14 and method of the invention facilitates the primary business entity or an affiliate acting as a service provider for maintaining the remote data processing systems 18 within a defined trading group. The service provider may maintain control over the remote data processing systems 18 and their components even though the remote data processing systems 18 may be widely geographically dispersed across the United States or in foreign countries. The service provider can keep the software of the trading partners or secondary business entities in step with each other and the primary business entity to promote technical interoperability and timely cost-effective upgrades of software features.

The foregoing description of the system and method describe several illustrative examples of the invention. Modifications, alternative arrangements, and variations of these illustrative examples are possible and may fall within the scope of the invention. Accordingly, the following Claims should be accorded the reasonably broadest interpretation, which is consistent with the specification disclosed herein and not unduly limited by aspects of the preferred embodiments disclosed herein.